

Notice of Allowability	Application No.	Applicant(s)	
	10/060,737	HUANG ET AL.	
	Examiner	Art Unit	
	Jennifer A. Leung	1764	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address--

All claims being allowable, PROSECUTION ON THE MERITS IS (OR REMAINS) CLOSED in this application. If not included herewith (or previously mailed), a Notice of Allowance (PTOL-85) or other appropriate communication will be mailed in due course. **THIS NOTICE OF ALLOWABILITY IS NOT A GRANT OF PATENT RIGHTS.** This application is subject to withdrawal from issue at the initiative of the Office or upon petition by the applicant. See 37 CFR 1.313 and MPEP 1308.

1. ☒ This communication is responsive to the amendment filed November 21, 2005.
2. ☒ The allowed claim(s) is/are 40-53.
3. ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
 - a) ☐ All b) ☐ Some* c) ☐ None of the:
 1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this national stage application from the International Bureau (PCT Rule 17.2(a)).

* Certified copies not received: _____.

Applicant has THREE MONTHS FROM THE "MAILING DATE" of this communication to file a reply complying with the requirements noted below. Failure to timely comply will result in ABANDONMENT of this application.

THIS THREE-MONTH PERIOD IS NOT EXTENDABLE.

4. ☐ A SUBSTITUTE OATH OR DECLARATION must be submitted. Note the attached EXAMINER'S AMENDMENT or NOTICE OF INFORMAL PATENT APPLICATION (PTO-152) which gives reason(s) why the oath or declaration is deficient.
5. ☐ CORRECTED DRAWINGS (as "replacement sheets") must be submitted.
 - (a) ☐ including changes required by the Notice of Draftsperson's Patent Drawing Review (PTO-948) attached
 - 1) ☐ hereto or 2) ☐ to Paper No./Mail Date _____.
 - (b) ☐ including changes required by the attached Examiner's Amendment / Comment or in the Office action of Paper No./Mail Date _____.

Identifying indicia such as the application number (see 37 CFR 1.84(c)) should be written on the drawings in the front (not the back) of each sheet. Replacement sheet(s) should be labeled as such in the header according to 37 CFR 1.121(d).
6. ☐ DEPOSIT OF and/or INFORMATION about the deposit of BIOLOGICAL MATERIAL must be submitted. Note the attached Examiner's comment regarding REQUIREMENT FOR THE DEPOSIT OF BIOLOGICAL MATERIAL.

Attachment(s)

- | | |
|---|--|
| 1. <input type="checkbox"/> Notice of References Cited (PTO-892) | 5. <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 2. <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 6. <input type="checkbox"/> Interview Summary (PTO-413),
Paper No./Mail Date _____. |
| 3. <input type="checkbox"/> Information Disclosure Statements (PTO-1449 or PTO/SB/08),
Paper No./Mail Date _____ | 7. <input checked="" type="checkbox"/> Examiner's Amendment/Comment |
| 4. <input type="checkbox"/> Examiner's Comment Regarding Requirement for Deposit
of Biological Material | 8. <input type="checkbox"/> Examiner's Statement of Reasons for Allowance |
| | 9. <input type="checkbox"/> Other _____. |

EXAMINER'S AMENDMENT

An examiner's amendment to the record appears below. Should the changes and/or additions be unacceptable to applicant, an amendment may be filed as provided by 37 CFR 1.312. To ensure consideration of such an amendment, it MUST be submitted no later than the payment of the issue fee.

Authorization for this examiner's amendment was given in a telephone interview with Mr. R. Joseph Foster on April 25, 2006. The application has been amended as follows:

IN THE CLAIMS:

Claims 1-39 (Cancelled).

Claim 40 (New). A micro-machined chemical-mixing device comprising:
a stack of a plurality of laminae, said laminae defining a plurality of micro-machined elements therein, including,

an evaporator for evaporating a liquid chemical, said evaporator comprising an inlet in fluid communication with a supply of non-pressurized liquid chemical, a feed path that delivers said liquid chemical to the evaporator inlet, a membranous pad having a plurality of patterned holes and grooves defined thereon for increasing the surface adhesion and flow of the chemical within the evaporator, and an outlet that discharges the evaporated chemical from said evaporator;

a chamber for mixing and combusting the evaporated chemical, said chamber located adjacent to said evaporator and comprising a first inlet, a second inlet and an outlet, wherein said first inlet is in fluid communication with said evaporator

Art Unit: 1764

outlet and said second inlet is in fluid communication with a supply of non-pressurized oxidizer, and wherein the evaporated chemical entering the chamber via said first inlet mixes with the non-pressurized oxidizer entering the chamber via said second inlet to thereby form a volume of combustible fluid, said chamber further comprising an initiator for providing energy to combust said volume of combustible fluid according to a desired ignition sequence; and

an exhaust nozzle for discharging the combusted fluid from said device, said nozzle fluidly communicating with said chamber outlet, and said nozzle being elongated and narrow relative to the length and width, respectively, of said chamber;

wherein, during the operation of said device, the combustion of the volume of combustible fluid within said chamber generates a pressure wave that propagates toward the chamber outlet and through the exhaust nozzle, thereby causing a temporary state of low-pressure within said chamber that automatically draws in additional oxidizer through said second inlet to mix with additionally evaporated chemical from said evaporator, and thereby forming a new volume of combustible fluid to be subsequently combusted, in a controlled manner, based on said ignition sequence.

Claim 41 (New). The device of claim 40, wherein the supply of non-pressurized oxidizer comprises a gaseous oxidizer.

Claim 42 (New). The device of claim 41, wherein the gaseous oxidizer comprises ambient air.

Claim 43 (New). The device of claim 40, wherein said feed path comprises at least one channel for delivering said liquid chemical to said evaporator.

Art Unit: 1764

Claim 44 (New). The device of claim 40, wherein said laminae comprise at least one material selected from the group consisting of silicon, plastic, ceramic and glass based materials.

Claim 45 (New). The device of claim 40, wherein said evaporator comprises at least a second inlet to allow for the supply of at least a second chemical to said evaporator.

Claim 46 (New). The device of claim 45, wherein the supply of non-pressurized oxidizer comprises a gaseous oxidizer, and the gaseous oxidizer mixes with at least two different chemicals in said chamber to form said volume of combustible fluid.

Claim 47 (New). The device of claim 40, wherein said initiator comprises at least one igniter selected from the group consisting of spark plugs and thermo-resistive wires.

Claim 48 (New). The device of claim 40, wherein the chamber comprises at least one temperature sensor for detecting efficient mixing between the evaporated chemical and the oxidizer.

Claim 49 (New). The device of claim 48, wherein the chamber comprises at least one pressure sensor for detecting efficient mixing between the evaporated chemical and the oxidizer.

Claim 50 (New). The device of claim 40, wherein the device contains no valves, chemical pumps, pressurized chemical lines or pumps.

Claim 51 (New). The device of claim 40, wherein the device contains no moving parts.

Claim 52 (New). A system for mixing and combusting chemicals, said system comprising: a micro-machined chemical-mixing device formed by a stack of a plurality of laminae, said laminae defining a plurality of micro-machined elements therein, including,

an evaporator for evaporating a liquid chemical, said evaporator comprising an inlet in

Art Unit: 1764

fluid communication with a supply of non-pressurized liquid chemical, a feed path that delivers said liquid chemical to the evaporator inlet, a membranous pad having a plurality of patterned holes and grooves defined thereon for increasing the surface adhesion and flow of the chemical within the evaporator, and an outlet that discharges the evaporated chemical from said evaporator;

a chamber for mixing and combusting the evaporated chemical, said chamber located adjacent to said evaporator and comprising a first inlet, a second inlet and an outlet, wherein said first inlet is in fluid communication with said evaporator outlet and said second inlet is in fluid communication with a supply of non-pressurized oxidizer, and wherein the evaporated chemical entering the chamber via said first inlet mixes with the non-pressurized oxidizer entering the chamber via said second inlet to thereby form a volume of combustible fluid, said chamber further comprising an initiator for providing energy to combust said volume of combustible fluid according to a desired ignition sequence; and

an exhaust nozzle for discharging the combusted fluid from said device, said nozzle fluidly communicating with said chamber outlet, and said nozzle being elongated and narrow relative to the length and width, respectively, of said chamber; wherein, during the operation of said device, the combustion of the volume of combustible fluid within said chamber generates a pressure wave that propagates toward the chamber outlet and through the exhaust nozzle, thereby causing a temporary state of low-pressure within said chamber that automatically draws in additional oxidizer through said second inlet to mix with additionally evaporated chemical from said evaporator, and thereby forming a new volume of

Art Unit: 1764

combustible fluid to be subsequently combusted, in a controlled manner, based on said ignition sequence.

Claim 53 (New). A method of mixing and combusting chemicals, comprising the steps of:

a) providing a micro-machined chemical mixing device, said device being formed from a stack of a plurality of laminae, said laminae defining a plurality of micro-machined elements therein, including,

an evaporator for evaporating a liquid chemical, said evaporator comprising an inlet in fluid communication with a supply of non-pressurized liquid chemical, a feed path that delivers said liquid chemical to the evaporator inlet, a membranous pad having a plurality of patterned holes and grooves defined thereon, and an outlet that discharges the evaporated chemical from said evaporator;

a chamber for mixing and combusting the evaporated chemical, said chamber located adjacent to said evaporator and comprising a first inlet, a second inlet and an outlet, wherein said first inlet is in fluid communication with said evaporator outlet and said second inlet is in fluid communication with a supply of non-pressurized oxidizer, said chamber further comprising an initiator; and

an exhaust nozzle for discharging the combusted fluid from said device, said nozzle fluidly communicating with said chamber outlet, and said nozzle being elongated and narrow relative to the length and width, respectively, of said chamber;

Art Unit: 1764

- b) supplying the liquid chemical to said evaporator and evaporating the chemical, wherein the membranous pad functions to increase the surface adhesion and flow of chemical within the evaporator;
- c) supplying the evaporated chemical from said evaporator to said chamber via the first inlet to mix with the non-pressurized oxidizer supplied via the second inlet, the mixture of evaporated chemical and non-pressurized oxidizer forming a volume of combustible fluid;
- d) activating the initiator to provide energy to combust the volume of combustible fluid, wherein the combustion generates a pressure wave that propagates toward the chamber outlet and through said exhaust nozzle, thereby causing a temporary state of low-pressure within said chamber that automatically draws in additional oxidizer through said second inlet to mix with additionally evaporated chemical from said evaporator and to thereby form new volumes of combustible fluid; and
- e) controlling the operational temperature and operational frequency of said device by activating the initiator according to a desired ignition sequence for subsequently combusting the new volumes of combustible fluid.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Jennifer A. Leung whose telephone number is (571) 272-1449.

The examiner can normally be reached on 9:30 am - 5:30 pm Monday through Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Glenn A. Caldarola can be reached on (571) 272-1444. The fax phone number for

Art Unit: 1764

the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Jennifer A. Leung
April 26, 2006 *JAL*

Alexa Neckel
ALEXA DOROSHENK NECKEL
PRIMARY EXAMINER